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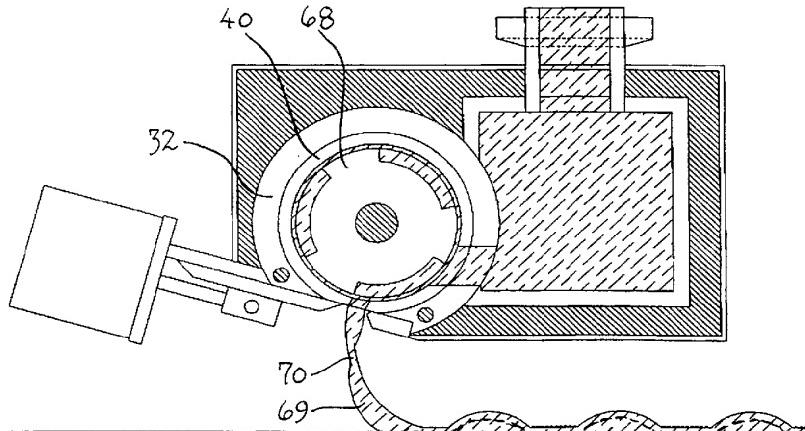
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ROAD MARKER AND ROAD MARKING DEPOSITS



WO 03/006744 A1

(57) Abstract: Device (22) for mounting on or integrating with a vehicle (11), to deposit a flowable material on roads. A pressurized marking mass container (46) receives a flowable marking mass which is fed through a valve with a flapper (35) at an outlet aperture (33) facing a base and with the axis transverse to the driving direction of the vehicle. The said valve member is connected to a secondary valve member (68) arranged with its longitudinal axis parallel to the outlet aperture (33) in a sleeve element (32). The secondary valve member is provided with longitudinal grooves (43-45) in its circumference, and the grooves (43-45) connects in at least a part of its rotational movement an inlet aperture (47) from the marking mass container (46) with the outlet aperture (33) at the flapper (35). The flappers (35) is about 1-5 cm, and that the flappers (35) are individually controllable by a computer. Moreover, a marking for roads and similar bases are provided where a flowable marking mass is deposited from a deposition device which can deposit a continuous or partitioned layer. The marking comprises a uniform top layer (70) which is deposited simultaneously with and over a design of distributed segments (69) to provide an integration of said two parts (69, 70) during deposition.

Road marker and road marking deposits

The invention relates to a device according to the introductory part of claim 1, to deposit marking on a base, particularly roads, streets and parking areas, as well as a marking deposit for 5 roads and similar areas, as stated in the introduction of claim 12.

Background

From Norwegian patent application 19985753 (Trysil Maskin) there is known a device for mounting on a vehicle, in which a pressurized container is supplied with a flowable marking 10 mass from a storage container. The marking mass is supplied through a valve member with a flapper, with an outlet opening facing the base with the longitudinal axis perpendicular to the driving direction. This valve member is connected to a secondary valve device which is arranged with the axis parallel to the outlet opening in a cylindrical sleeve. The secondary valve device is provided with a longitudinal circumferential groove which can connect an inlet opening from the 15 container to an outlet opening at the flapper.

This device functions satisfactorily when depositing longitudinal ribbons on roads, but is not designed for depositing of designs and is not suitable for controlled deposition of markings with an improved reflectivity at wet marking and for marking masses requiring heating.

20 Object

The main purpose of the invention is to provide an improvement of the known device, enabling an improvement in the function of wet marking.

Further it is an object to expand the area of mechanical depositing of markings, to cover tasks which today are handled manually.

25 It is an object to mechanically deposit graphical designs which previously have to be prepared in advance or needed complicated manual forming. The change from one design to another should be easily and rapidly possible.

It is still another object to provide a device for depositing marking, which can be operated at a higher speed and which is more flexible to use than known marking devices.

30 It is also an object to provide a device which can deposit markings with sharper corners and edges than the prior art device.

The device should have few parts subject to wear and the parts subject to wear should be easily changed and be inexpensive.

The depositing device should deposit defined markings from the start, without delay and heating problems.

Finally it is an object to provide a road marking with an improved function when wet, i.e. increased reflecting power and added wear resistance.

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The Invention

The invention is stated in claim 1 and 12. further details are stated in the remaining claims.

More details regarding design, function and effects of the invention will be described in more detail in the following, with reference to the drawings.

10

Examples

The invention is illustrated in the drawings, in which

Fig. 1 shows a side view of a vehicle equipped with a device according to the invention,

Fig. 2 shows a top plan view of the vehicle in Fig. 1,

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Fig. 3-5 shows a section of three embodiments of the invention,

Fig. 6 shows a vertical section of a road marking according to an embodiment of the invention,

Fig. 7 shows a bottom plan view of a device according to the invention, showing flappers and outlet openings, and

20

Fig. 8 shows examples of designs being deposited with the device according to claim 1.

In Fig. 1 and 2 there is shown a truck 11, on the tray or deck 12 of which equipment is arranged for transport and depositing of marking mass. This equipment comprises two tanks 13, 14 for glass beads, three heated tanks 15, 16, 17 for thermoplastic marking mass, a valve 18, 19, 20 in 25 the outlet of each of these tanks 15, 16, 17, a pump 21 for supplying marking mass to a deposition assembly being mounted transversely at the back end of the truck, close to the road 23 with suitable facilities, e.g. a supporting wheel or a laser telemeter. The deposition assembly 22 will be described in more detail with reference to Fig. 3.

30 Each heated tank 15, 16, 17 is provided with a heating element 24. At the back of the platform 12 of the truck, is a vertical light sign 25 for warning road users.

In Fig. 3, there is shown a deposition assembly 31 with a carrying tube 32, the tube 32 having an outlet aperture 33 being provided by a milling leaving a downwardly facing and forwardly inclined chordal face 34, providing base for a series of flappers 35 arranged side by

side and which are joined with a link 36 to a piston rod 37 from a schematically illustrated hydraulic or pneumatic cylinder 38 arranged on a bracket 39.

The flappers 35 have a width between 1-5 cm, e.g. 2,5 cm, and in any case less than 10 cm.

Inside the carrying tube 32 is arranged a tubular sleeve 40 with a longitudinal aperture 41 at 5 the outlet aperture 33. Inside the sleeve 40, which may be manufactured of wear resistant hard metal, is a cylindrical rotor 42 with three longitudinal grooves 43, 44, 45, each having a width of about 70° and being evenly distributed around the circumference. Rotors with different numbers and angular extension of grooves may, however, be conceived.

On the opposite side of the carrying tube 32 relative to the cylinders 38, which in use is the 10 rear part of the deposition assembly 31 is a square tube 46 which creates a manifold by being open to an inlet aperture 47 leading to the rotor 42. The inlet aperture 47 may extend over about 40° of the circumference of the rotor. The manifold 46 and the carrying tube 32 are surrounded by a boxlike heating casing 48 which is supplied with heated oil or similar matter for increasing the temperature of the marking mass 49 in the manifold.

15 The manifold 46 is supplied with marking mass from the pump 21 (Figs. 1 and 2) through one or more pipe sockets at the upper side of the manifold 46.

The rotor 42 is powered by an hydraulic motor 51 arranged at the end of the deposition assembly 31 (Fig. 2). The cylinders 38 are connected to a compressor system with valves which are controlled on and off by a compter (not shown). This will be described in more detail in the 20 following.

Fig. 3 shows how a blob 52 of marking mass is extruded each time one of the grooves 43, 44 passes the outlet aperture 33. This will deposit small “cakes” or segments 53 on the road 54. These segments may make desired designs, such as symbols and signs.

In this embodiment of the invention a system for preheating of the parts of the deposition 25 assembly contacted by the heated marking mass is provided. Centrally in the rotor 42 is arranged a bore 61, which is suitably connected to a circulation system for heated oil or another pumpable medium. Alternatively, an electric heating element can be inserted.

In the sleeve 40, a longitudinal bore 62, 63 may be arranged on the sides of the outlet aperture 33, which may be provided with heat supply like the bore 61.

30 In Fig. 4 there is shown an alternative embodiment with a tubular rotor 64 with rows of holes 65 around the circumference. Additionally the elements of the deposition assembly described above are present. This embodiment will deposit drops or blobs 66 on the road like the embodiment of Fig.3. In the rotor 64 is arranged a centrally located tube 67 for supply of heating medium as described above for the bore 61.

In Fig. 5 there is shown a further embodiment 1, with a rotor corresponding to the rotor 68 of the embodiment in Fig. 3, but wherein the outer diameter of the rotor is less than the inner diameter of the sleeve 40. This produces a thin layer 70 being provided in addition to the drops or blobs 69 corresponding to the blobs 52 of Fig. 3. As this is carried out with a heated marking mass with relatively low viscosity, the covering layer will provide a continuous thin blanket over and between the segments.

In this manner, peaks 71 are provided in the layer 70. Fig. 6 shows how this kind of road marking combines the advantages of a wet function, i.e.. reflection at wet road and good luminance, and a strong adherence to the base, with a lower risk for removal with a road scraper 10 or snow scraper or similar, than for known road marking. Most of the surface will be inclined relatively to the ground. This will prevent accumulation of water on the surface of the marking deposits.

Known road marking has even surfaces which may be covered by water and thus have reduced reflecting ability. A road marking according to the invention will function better when it 15 is wet.

The remaining elements are generally like in the embodiment of Fig. 3.

In Fig. 7 shows schematically an example of a flapper arrangement with twelve control cylinders 72 arranged side by side for controlling a flapper 73, the flappers having substantially less width than on known deposition devices. Each control cylinder is connected to a computer 20 controlled and electrically operated valve for selective activation, i.e. opening and closing of an outlet aperture 74. The pistons of the control cylinders are connected to the flappers 73 with suitable rods 75 and carrying plates 76 (see also Fig. 3-5).

In Fig. 8 an example of marking of a traffic lane 81 on a road is shown. A continuous side line 82 and an inner dividing line 83 (related to right side traffic) are shown. In this traffic lane an 25 arrow 84, a road number marking 85 and a pedestrian crossing 86 are shown.

Additional to the elements shown in the drawing, the device according to the invention will comprise control equipment, based on known computer technology, for synchronous controlling of the flappers and the rotor. Such control equipment may be programmed to provide an arbitrary 30 chosen control of the deposition of the marking mass elements as described. This enables the deposition of markings with an edge radius down to about 1 cm. This further means that markings of different shapes may freely be deposited, markings related to traffic as illustrated in Fig. 8, as well as logos and texts of various shape. In this manner, it is possible to replace time consuming and strenuous manual deposition of marking mass with mechanical deposition. This

will increase both the speed of deposition and the freedom in choice of design. While previously having to precut difficult designs in a workshop, it will now be possible to deposit such designs with an easy programming and/or preprogrammed raster designs with raster points like the deposited segments. It will be possible to transfer arbitrary one-colour designs to a deposition vehicle by mobile telephone from a remote site.

In this way bicycle lanes, pedestrian crossings, parking lots for handicapped drivers etc. can be marked.

The flappers can be closely adjoined as shown in Fig. 7 to enable close marking deposition of segments 69.

10 The rotor of the various embodiments may suitably be manufactured of a softer steel than the sleeve. It should also be attached to the deposition assembly in a way to enable rapid exchange. Thus the rotor may be made an inexpensive and easily replaceable wear element.

Modifications

15 The rotor being provided for controlling the marking mass flow may be designed with surface structures other than shown in Figs. 3 and 4. The grooves can thus be helical arrangements or rows of recesses. The rotors thus may have different groove and/or recess design, with varying or uniform depth.

20 The deposition assembly 22 is shown to have a length corresponding to the width of the vehicle, e.g. about 250 cm. This will enable the deposition of a design with a width close to the width of a traffic lane. However, shorter versions can also be suitable, e.g. 50 cm for deposition of marking on one side of a traffic lane.

25 By depositing peaks 71 as shown in Fig. 5 and 6, with different heights, it is possible to let only some elements contact snow removing equipment which can destroy the exposed layer of glass beads. It is advantageous to sprinkle small glass beads on the top of the deposited marking mass immediately after the deposition. The glass beads will increase the reflection power. In this way, the marking will be less vulnerable to wear and attenuation of the reflection function.

Peaks with different heights can be provided by making the rotor with different depths of the recesses or grooves providing the segments 69.

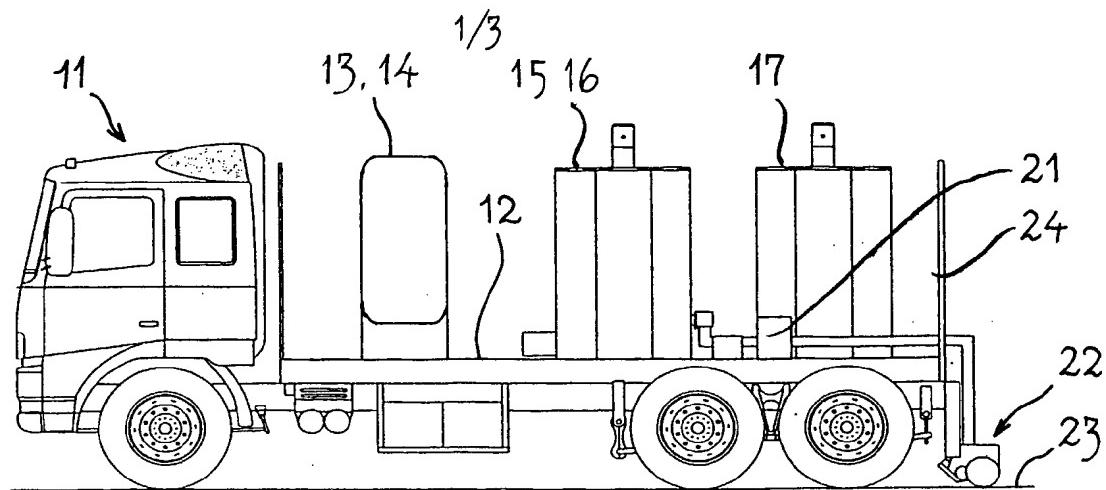
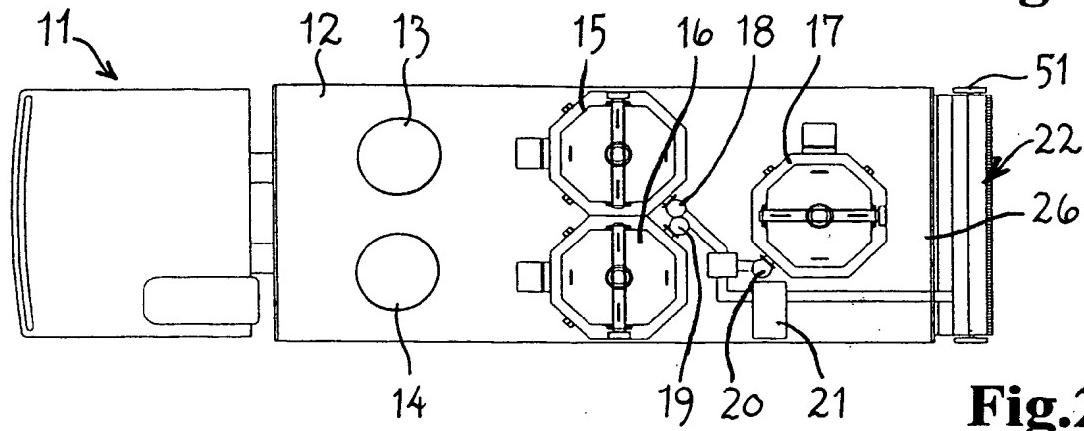
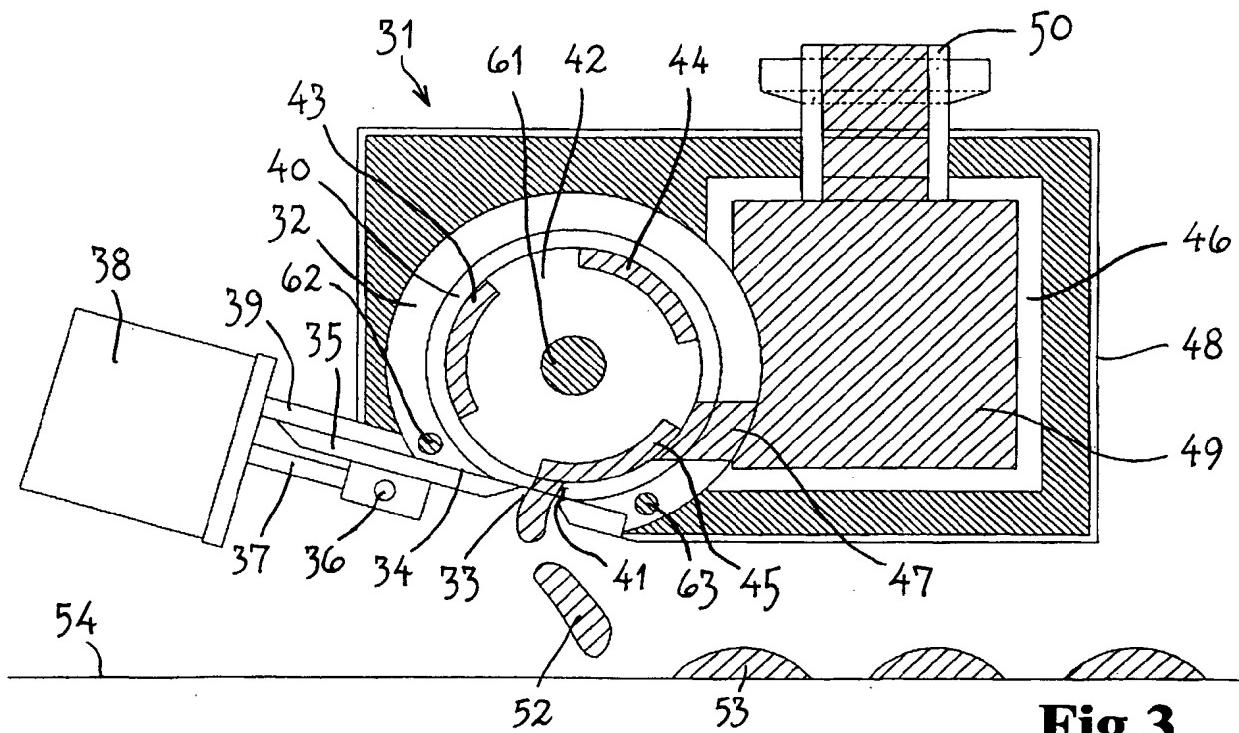
30 The rotors shown in the drawings are conceived for clockwise rotation. However, it can also be designed for counter-clockwise rotation.

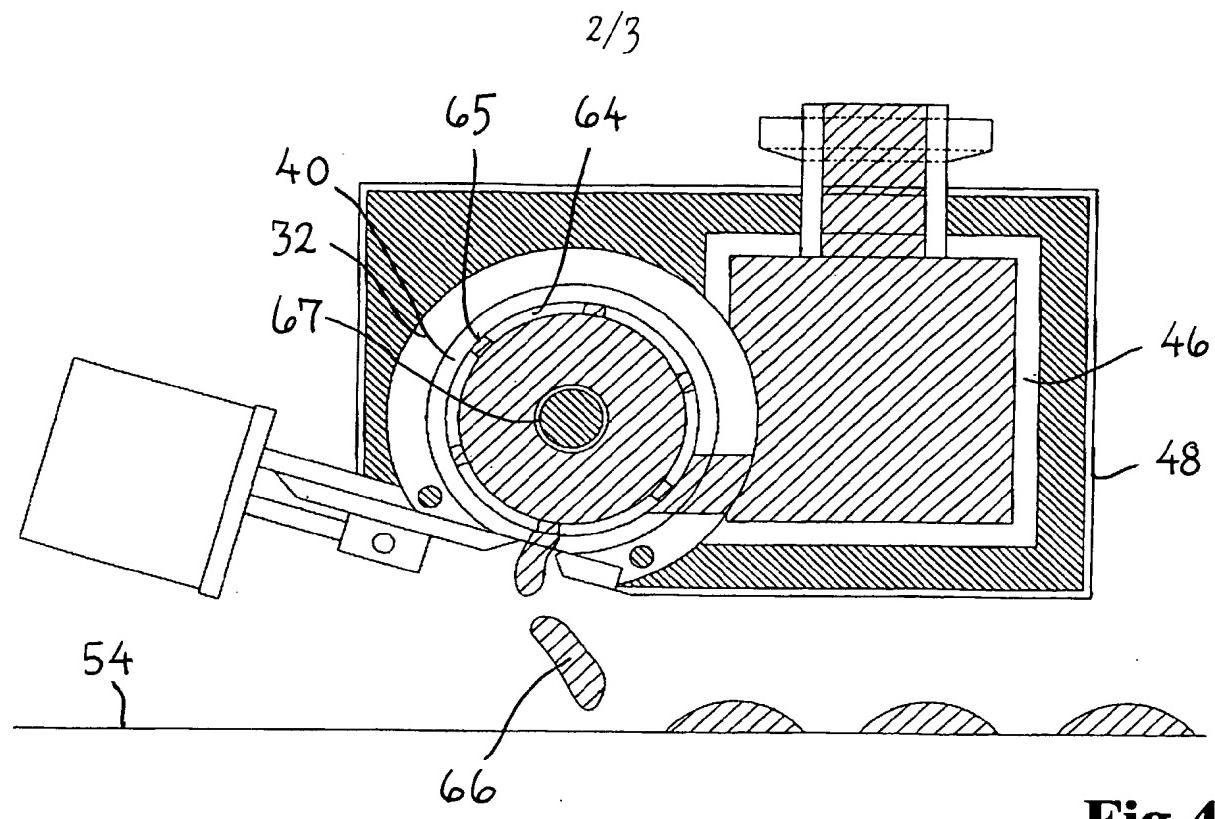
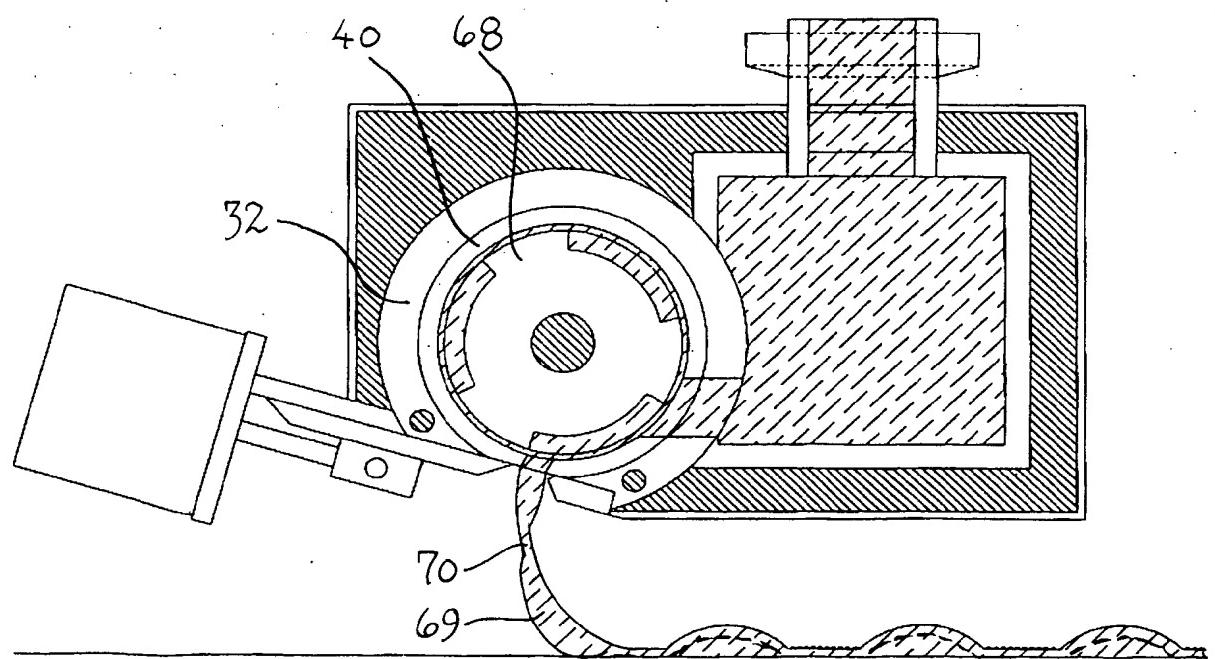
The invention can be used for an arbitrary marking mass. Additionally to a thermoplastic marking mass, it can be used for paints or blends of different marking masses, including two component masses and cold plastic masses etc.

Claims:

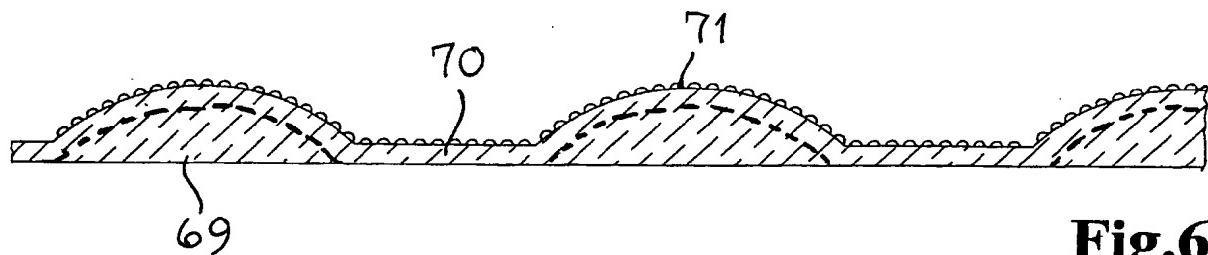
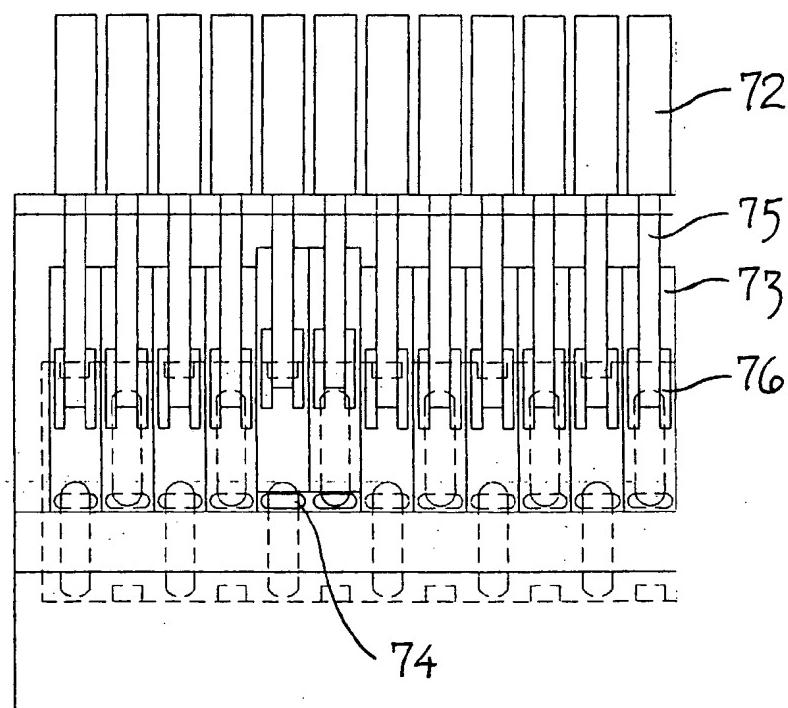
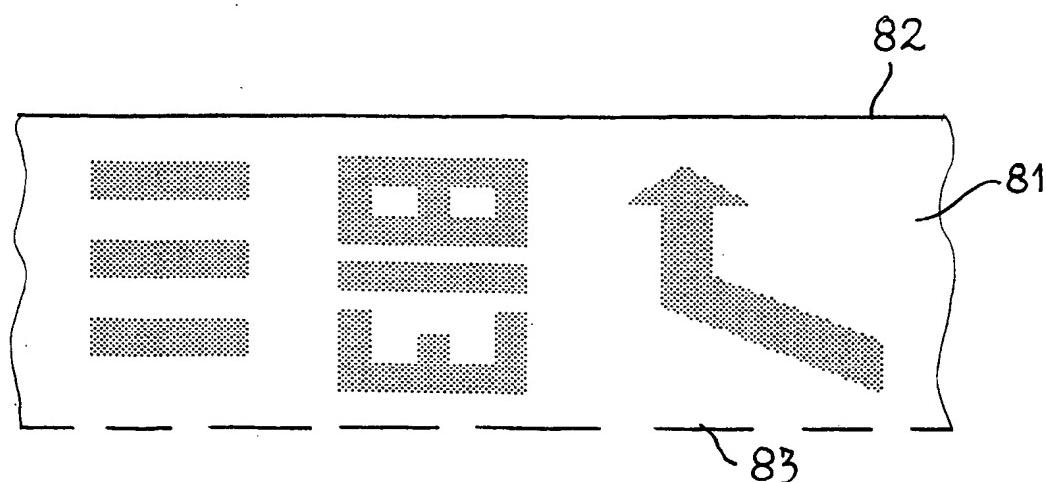
1. Device (22) for mounting on or integrating with a vehicle (11), to deposit a flowable material on a base, particularly for depositing marking mass on roads, parking lots, turnoffs and similar, wherein a pressurized marking mass container (46) receives a flowable marking mass from a storage container (15-17), which marking mass is fed through a valve with a flapper (35) at an outlet aperture (33) facing a base and with the axis transverse to the driving direction of the vehicle, said valve member being connected to a secondary valve member (42) arranged with its longitudinal axis parallel to the outlet aperture (33) in a sleeve element (32), in which the secondary valve member is provided with longitudinal grooves (43-45) in its circumference, and that the grooves (43-45) in at least a part of its rotational movement connects an inlet aperture (47) from the marking mass container (46) with the outlet aperture (33) at the flapper (35), **characterized** in that the width of the flappers (35) is about 1-5 cm, and that the flappers (35) are individually controllable by a computer.
- 15 2. Device according to claim 1, whereas the rotational valve member (42) is surrounded by a sleeve (40), **characterized** in that the flappers (35) bear against the sleeve (40) at the outlet aperture (33), a tubular housing (32) surrounding the sleeve is chamfered toward the outlet aperture (33) to make a base for the flappers (35).
- 20 3. Device according to claim 1 or 2, **characterized** in that the flappers (35) have a chamfered front end (73) facing the outlet aperture (33).
4. Device according to any one of claims 1-3, **characterized** in that the rotating valve member (61) is tubular with holes (62) in its wall, which preferably are arranged in mutually staggered rows around the circumference (Fig. 4).
- 25 5. Device according to any one of claims 1-4, **characterized** in that the rotating valve member has an inner passage (61 67) for the supply of heat, particularly in the form of heated oil or with electrical heating elements.
- 30 6. Device according to claim 5, in which the rotating valve member has a solid core, **characterized** in that the solid core has a generally central bore (61) connected to a circulation system for heated oil or similar medium or for insertion of an electrical heating element.

7. Device according to claims 3 and 5, **characterized** in that a tube (67) is inserted in the inner of the rotating valve member (64), for supply of heated oil or similar medium or for insertion of a heating element.
- 5 8. Device according to any one of claims 1-7, **characterized** in that the rotating valve member has an inner passage (62; 63) for the supply of heat, particularly in the form of heated oil or with electrical heating elements.
9. Device according to any one of claims 1-7, **characterized** in that the rotating valve member
10 (68) has a free space to the surrounding sleeve (40), preferably in the order of magnitude 1 mm radially.
10. Device according to any one of claims 1-9, **characterized** in that the mass container (46) is connected to a manifold for distributing marking mass, to provide a uniform supply of marking
15 mass at different consumption of marking mass by the different flappers.
11. Device according to any one of claims 1-10, **characterized** in that the deposition device has a length approximating like the width of the carrying vehicle (12).
- 20 12. Marking for roads and similar bases, where a flowable marking mass is deposited from a deposition device which can deposit a continuous or partitioned layer, **characterized** in that it comprises a continuous and uniform top layer (70) which is deposited simultaneously with and over a design of distributed segments (69) to provide an integration of said two parts (69, 70) during deposition.
25
13. Marking according to claim 12, **characterized** in that the distributed segments (69) consists of rounded, preferably circular or elliptic, elements and the distance between adjacent segments is in the order of 0,5-1 times the diameter of the segments.
- 30 14. Marking according to claim 12 or 13, **characterized** in that the segments (69) have different heights.
15. Marking according to claim 14, **characterized** in that the top layer (70) has a thickness of about 0,5-1,5 mm, while the integrated and distributed segments (69) have a thickness of 0,5-3
35 mm.

**Fig.1****Fig.2****Fig.3**

**Fig.4****Fig.5**

3/3

**Fig.6****Fig.7****Fig.8**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00196

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01C 23/24, E01F 9/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E01C, E01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	NO 311733 B1 (TRYSL MASKIN AS), 14 January 2002 (14.01.02), page 2, line 19 - line 26; page 2, line 32 - line 34, abstract, figure, detail 26, patent family member, NO 985753 A, 9 June 2000 (09.06.2000) --	1-11
Y	EP 0632166 A1 (WALTER HOFMANN GMBH, MASCHINENFABRIK UND VERTRIEB), 4 January 1995 (04.01.95), column 1, line 35 - line 38, figures 1, 4, abstract, details 11,22 --	1-11
X	US 5835271 A (STUMP ET AL), 10 November 1998 (10.11.98), figure 10 --	12-15

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2002	14-10-2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Örjna Nylund / JA A Telephone No. + 46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00196

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5676488 A (HEDBLOM), 14 October 1997 (14.10.97), figures 4,6A --	12-15
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A	US 6227454 B1 (WOLF ET AL), 8 May 2001 (08.05.01), figures 4A,5A,5B, details 82,84 --	1-15
A	NO 150491 B (WEGENBOUWMAATSCHAPPIJ J. HEIJMANS B.V.), 16 July 1984 (16.07.84), figure 5, detail 26 -- -----	12-15

INTERNATIONAL SEARCH REPORT

Int'l application No.
PCT/NO 02/00196

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claim 1-11 direct to a road marker machine.

Claim 12-15 direct to a road marking deposit.

These groups of inventions are not so linked as to form a general inventive concept. There is no technical relationship among the inventions involving one or more of the same or corresponding technical features.

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
 No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

30/09/02

International application No.

PCT/NO 02/00196

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